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Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **ME353U - Machine Design-II**

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Maximum Marks : **60**   Duration : **3 Hrs**

Edit   Print   View Answer Key   Close   **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. *All questions are compulsory.*
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1)   **Attempt any <u>Two</u> from following Sub-Questions.**

a) **What does properties shall be considered for selecting material for Sliding contact bearing.**   [08]

b) **Find the BHN required for wear, and a suitable P for a stress of 28000 psi in bending for a pair of 20^0 full-depth steel bevel gear to transmit 100 hp at 600 rpm for the pinion. Speed ratio is 3:2, with outside diameter of 15 in and 10 in. Width of face is 2.5 in. Gears have class 2 accuracy**   [08]

c) **A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the stand point of strength.**   [08]

2)   **Attempt any <u>Two</u> from following Sub-Questions.**

a) **Derive the Lewis equation for beam strength of teeth of Spur gear.**   [10]

b) **A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 r.p.m. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for 20° full depth involute gear may be taken as $0.154 - \frac{0.912}{T_E}$, where T_E represents the equivalent number of teeth.**   [10]

c) **A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20 × 106 revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing.**   [10]

3)   **Attempt <u>All</u> from following Sub-Questions.**

a) **Explain following terms**   [06]
   (i)   Circular pitch of spur gear,
   (ii)   Addendum angle of bevel gear,
   (iii) Lead of worm gear.

b) **A quadruple hardened steel worm and phosphor bronze have an output horsepower of 10. The wheel has 40 teeth; P_n is 1.0472 in. centre distance is 8.9333 in. Worm speed n_1 is 600 rpm.Find the value of the dynamic load, and check if the tooth is sufficiently strong in bending and wear. Take allowable bending stress for bronze as 20000 psi, φ = 25^0 .**   [06]

4)   **Attempt <u>All</u> from following Sub-Questions.**

a) **The load on the journal bearing is 150 kN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following :**   [08]
   1. Length of the bearing if the allowable bearing pressure is 1.6 N/mm2, and
   2. Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil at 60°C is 0.02 kg/m-s and the bearing clearance is 0.25 mm.

b) **In a particular application, the radial load acting on a ball bearing is 5 KN and the expected life for 90% of bearings is 8000 hrs.Calculate the dynamic load carrying capacity of the bearing, when the shaft rotates at 1450 rpm.**   [04]

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